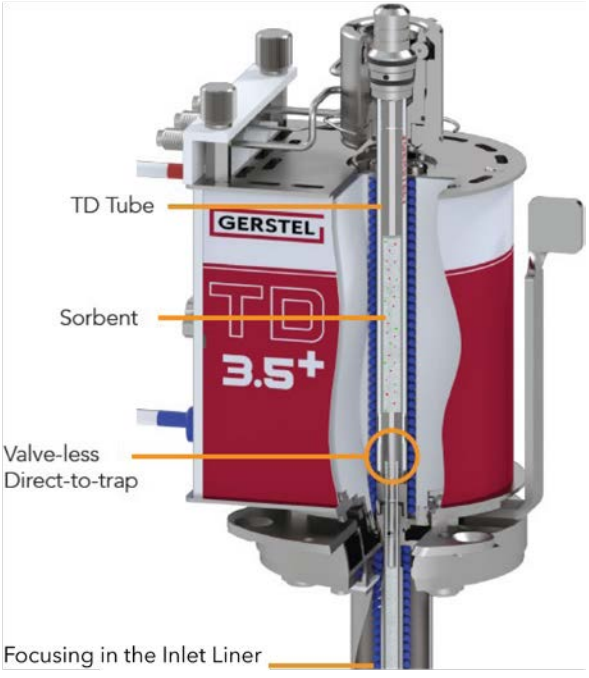
Air Monitoring and Material Emissions

Dynamic Focusing: A Novel Cryogen-Free Technique for Determining VVOCs, VOCs, and SVOCs

Dynamic Focusing for Thermal Desorption is a novel technique in the field of air monitoring and material emissions analysis that eliminates the need for cryogenic cooling while delivering exceptional results. Dynamic Focusing enables analytical laboratories to determine very volatile, volatile, and semi-volatile organic compounds (VVOCs, VOCs, and SVOCs) with high accuracy and precision, low limits of detection, and high efficiency.

The graphics on the next page illustrate the dynamic focusing process.



VVOC, VOC, and SVOC analysis by TD

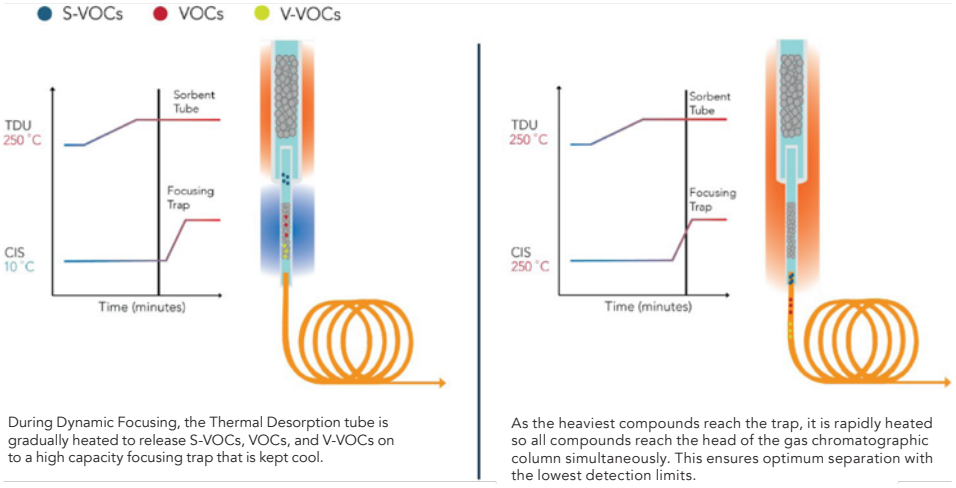
Dynamic Focusing is a novel cryogen- free technique, integral to the GERSTEL TD Core system, developed for use in thermal desorption based analysis of air. Dynamic Focusing is used to focus and trap VVOCs, VOCs, and SVOCs before releasing them to the gas chromatography (GC) column in a sharp band for analysis. The Dynamic Focusing technique has successfully undergone rigorous testing, including compliance with methods like U.S. EPA TO-17 and ISO 16000-6, and it has excelled in inter-laboratory proficiency tests.

Understanding Dynamic Focusing:

Dynamic Focusing diverges from traditional thermal desorption methods in key ways: A single, relatively weak sorbent is packed into the trap liner, and the trap temperature is set to +10 °C. Instead of trapping and desorbing in two separate stages, these are overlapped:

Medium to high boilers are trapped by the sorbent and desorbed upon heating, while very volatile organic compounds (VVOCs) are slowed down just enough to be focused into a sharp band, resulting in remarkably sharp peaks.

Precise timing of temperature and flow provides optimum separation

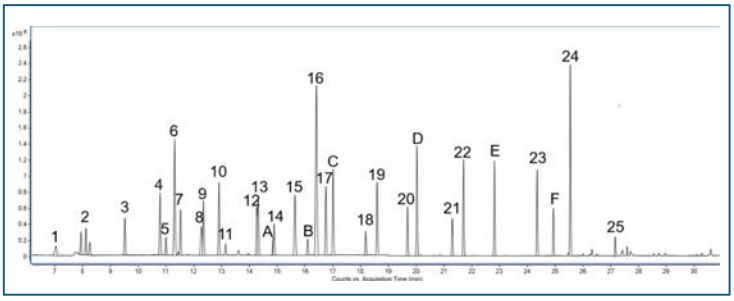


During Dynamic Focusing, the Thermal Desorption tube is gradually heated to release S-VOCs, VOCs, and V-VOCs on to a high capacity focusing trap that is kept cool.

As the heaviest compounds reach the trap, it is rapidly heated so all compounds reach the head of the gas chromatographic column simultaneously. This ensures optimum separation with the lowest detection limits.

Benefits of Dynamic Focusing:

- Streamlined system Design: The TD tube and trap are directly connected (liner-in-liner) and the GC column is directly inserted into the trap, minimizing void volume, and eliminating the need for valves or transfer lines. This design reduces analyte contact with surfaces that can impact recovery and cause carry-over.
- PFAS-Free Flow Path: Absence of PTFE (Teflon™) material in the analyte flow path eliminates the potential for introduction of PFAS-related compounds as well as the loss of these compounds by sorption into PTFE, which are crucial aspects of today's environmental analysis methods.
- Cryogen-Free Cooling: Peltier elements cool the trap to +10 °C, focusing compounds as volatile as propylene (C3) and covering the full range of analytes for standard air analysis methods
- User-Friendly-Low Maintenance: Easy to use, maintain, and troubleshoot, resulting in improved system uptime
- Wide Range of Applications: Dynamic Focusing is suitable for a range of Standard Methods, including US EPA TO-17, ISO 16000-6, and ASTM D6196



Chromatogram of a TO-17 gas standard (numerically labeled) and spiked gas internal standards (alphabetically labeled). Based on Dynamic Focusing and full scan MS detection.

Cryogen-Free Dynamic Focusing for Thermal Desorption, in a system without valves or transfer lines, introduces a new level of performance and simplicity to air monitoring. This innovative technique offers researchers and environmental scientists a powerful tool to determine very volatile to semi-volatile organic compounds with high accuracy and precision combined with high efficiency. By eliminating both the need for cryogenic cooling and valves & transfer lines in the sample pathway. Dynamic Focusing streamlines the entire workflow for targeted VVOC, VOC, and SVOC determination, reliably delivering high quality data while reducing maintenance cost and system downtime.